

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In Re Application of ) For: LOW PRESSURE REVERSE  
JOHN EDWARD TOMASCHKE ) OSMOSIS AND NANOFILTRATION  
Serial No.: 09/724,883 ) MEMBRANES AND METHOD FOR  
Filing Date: November 28, 2000 ) THE PRODUCTION THEREOF  
Group Art Unit: 1723

**SUBSTITUTE BRIEF ON APPEAL UNDER 37 C.F.R. §§ 41.31 and 41.37;**  
**REFERRAL TO CANCELLATION OF CLAIMS UNDER 37 C.F.R. § 41.33**

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P.O. Box 1450  
Alexandria, VA 22313-1450

Attention: Krishnan S. Menon  
Examiner

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**MARKED-UP COMPARISON**  
**COPY OF BRIEF**  
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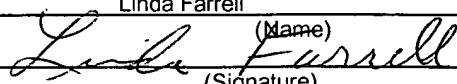
Dear Sir:

This substitute Appeal Brief is filed under the provisions of 35 U.S.C. § 134 and 37 C.F.R. Part 41, specifically §§ 41.31 and 41.37, and in response to the Office Action of March 29, 2005. A Notice of Appeal was filed on in this case on January 24, 2005. Enclosed herewith are a) an Amendment to cancel certain of the claims previously noticed as being appealed and b) a marked-up copy of the original Appeal Brief to indicate the changes made thereto in response to the Office Action.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on April 27, 2005.

Linda Farrell

(Name)

  
(Signature)

April 27, 2005

(Date of Signature)

## I. Real Party in Interest

The real party in interest on this appeal is Hydraunatics, Inc., a corporation and the assignee of Appellant Applicant Tomaschke.

## II. Related Appeals and Interferences

There are no related appeals or interferences.

## III. Status of Claims<sup>1</sup> and Identification of Claims on Appeal

~~While preparing this Brief, Applicant's Appellant's attorney realized has noticed~~ that prior amendments ~~had have~~ resulted in independent Claims 15 and 29 inadvertently being made identical. As the sets of dependent claims following each independent claim ~~were are~~ parallel, that ~~had has~~ resulted in the claims on appeal being two duplicate sets.

Appellant is therefore submitting herewith an Amendment to cancel ~~Therefore, Applicant now cancels~~ Claims 29-39 inclusive as duplicative. While Appellant agrees with the Examiner's statement in the Office Action of March 29, 2005, that amendment is not a matter or right, Appellant notes that appellate review of two duplicate sets of claims is counterproductive and will therefore presume -- hopefully correctly -- that the amendment will be approved. Therefore Appellant will proceed in this brief with arguments directed to appeal of ~~and will proceed on the appeal with~~ Claims 15-21, 23, 25 and 27-28, the remaining claims not previously cancelled or withdrawn, ~~and will not expressly address Claims 29-39 other than as required by the Patent Office Rules. The rejections of Claims 29-39 are therefore no longer applicable and will not be argued on this appeal.~~

Should Appellant have made such presumption incorrectly and the

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<sup>1</sup> The original claims were numbered 1-13 and 15-27. The number "14" in the original claim sequence was inadvertently omitted. In the first Office Action the Examiner renumbered Claims 15-27 as Claims 14-26, and then issued a restriction requirement in which renumbered Claims 1-14 were defined as Group I and Claims 15-26 were defined as Group II. The claims of Group II (Claims 15-26) were elected and remained in the present application while Claims 1-14 were cancelled as being directed to a non-elected invention. The status of Claims 13 and 14 as product-by-process claims was considered and the Examiner ruled that those claims properly belonged to Group I.

accompanying Amendment is not accepted or entered, then Appellant respectfully requests that the Board of Appeals consider that all arguments made herein in support of patentability of Claims 15-21, 23, 25 and 27-28 and reversal of the rejections thereof are also fully and equally applicable with respect to Claims 29-39 and reversal of the rejections thereof, and render a decision on appeal as to all Claims 15-21, 23, 25 and 27-39 accordingly.

Appellant's Applicant's attorney apologizes for any inconvenience that this may have caused the Examiner or the Board of Appeals.

[ \_\_\_\_\_ ]

1. (cancelled) A method for production of a low pressure membrane useful for reverse osmosis and nanofiltration which comprises contacting a first membrane containing a crosslinked polyamide salt rejecting layer with a solution of an organic sulfonic acid compound for a contact time and at a temperature sufficient to produce said low pressure membrane having a water flux of at least about 15 gfd and a sodium chloride rejection of at least about 20 percent for reverse osmosis at 75 psi and 25°C using 0.05 weight percent aqueous sodium chloride.
2. (cancelled) A method as in Claim 1 wherein said crosslinked polyamide comprises the reaction product of an aromatic diamine or triamine and an aromatic triacyl halide.
3. (cancelled) A method as in Claim 2 wherein said crosslinked polyamide comprises the reaction product of an aromatic diamine or triamine, an aromatic triacyl halide and an aromatic diacyl halide.
4. (cancelled) A method as in Claim 1 wherein said first membrane comprises a thin film composite, flat sheet, hollow fiber or tubular membrane.
5. (cancelled) A method as in Claim 4 further comprising disposing said first

membrane into a filtration device prior to contact thereof with said solution of an organic sulfonic acid compound

6. (cancelled) A method as in Claim 4 further comprising disposing said first membrane into a filtration device following contact thereof with said solution of an organic sulfonic acid compound.

7. (cancelled) A method as in Claim 1 wherein organic sulfonic acid compound comprises a sulfoacetic, sulfobenzoic, sulfoisophthalic, sulfophthalic, sulfosalicylic, sulfosuccinic, hydroxybenzene sulfonic, hydroxybutane sulfonic, dihydroxy benzene sulfonic or dihydroxybenzene disulfonic acid or a mixture thereof.

8. (cancelled) A method as in Claim 1 wherein organic sulfonic acid compound comprises a C1-C6 alkyl, alkenyl, haloalkyl, haloalkenyl or aryl sulfonic acid compound.

9. (cancelled) A method as in Claim 8 wherein said organic sulfonic acid compound comprises methanesulfonic acid, trifluoromethanesulfonic acid or a mixture thereof.

10. (cancelled) A method as in Claim 7 wherein said organic sulfonic acid compound further contains a C1-C8 carboxylic acid, hydroxy, alkoxy or halo functional group or a combination thereof.

11. (cancelled) A method as in Claim 1 wherein said solution of an organic sulfonic acid compound comprises said organic sulfonic acid compound dispersed or dissolved in water, alcohol, glycol, alkoxy alcohol or a carboxylic acid or a mixture thereof.

12. (cancelled) A method as in Claim 1 wherein said low pressure membrane has a sodium chloride rejection of at least about 80 percent and a flux of at least about 5 gfd when tested on 0.05 percent aqueous sodium chloride at 150 psi and 25°C.

13. (cancelled) A low pressure membrane useful for reverse osmosis and nanofiltration produced according to the method of Claim 1 and having water flux of at least about 15 gfd and a sodium chloride rejection of at least about 20 percent for reverse osmosis at 75 psi and 25°C using 0.05 weight percent aqueous sodium chloride.

14. (cancelled) A membrane as in Claim 1 having a sodium chloride rejection of at least about 80 percent and a flux of at least about 5 gfd when tested on 0.05 percent aqueous sodium chloride at 150 psi and 25°C.

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15. (ON APPEAL; rejected) A composite membrane useful for reverse osmosis or nanofiltration comprising:

a supportive porous under-structure; and

a top layer consisting of a crosslinked polyamide thin film which is adhered to the upper surface of the porous support structure, said top layer having been contacted with a solution of a C<sub>1</sub>-C<sub>6</sub> alkyl, alkenyl, haloalkyl, haloalkenyl, or hydroxy sulfonic or disulfonic acid compound,

whereby said membrane has a water flux of at least about 15 gfd and a rejection of at least 20 percent when tested on a 0.05 percent aqueous sodium chloride at 75 psi and 25°C.

16. (ON APPEAL; rejected) A composite membrane as in Claim 15 wherein said crosslinked polyamide comprises the reaction product of an aromatic diamine or triamine and an aromatic triacyl halide.

17. (ON APPEAL; rejected) A composite membrane as in Claim 16 wherein said crosslinked polyamide comprises the reaction product of an aromatic diamine or triamine, an aromatic triacyl halide and an aromatic diacyl halide.

18. (ON APPEAL; rejected) A composite membrane as in Claim 15 wherein the porous support is a polyarylethersulfone.

19. (ON APPEAL; rejected) A composite membrane as in Claim 15 wherein said first membrane comprises a thin film, flat sheet, hollow fiber or tubular membrane.

20. (ON APPEAL; rejected) A composite membrane as in Claim 15 wherein the membrane is a component of a spiral wound membrane filter or a plate and frame filter.

21. (ON APPEAL; rejected) A composite membrane as in Claim 15 wherein said organic sulfonic or disulfonic acid compound comprises a sulfoacetic, sulfosuccinic, methanesulfonic, ethanesulfonic, or hydroxybutane sulfonic compound or mixtures thereof.

22. (cancelled) A composite membrane as in Claim 16 wherein said organic sulfonic acid compound comprises a sulfoacetic, sulfobenzoic, sulfoisophthalic, sulfophthalic, sulfosalicylic, sulfosuccinic, hydroxybenzeno sulfonic, hydroxybutane sulfonic, dihydroxy benzene sulfonic or dihydroxy benzene disulfonic or a mixture thereof.

23. (ON APPEAL; rejected) A composite membrane as in Claim 15 wherein said organic sulfonic acid compound comprises methanesulfonic acid, trifluoromethanesulfonic acid or a mixture thereof.

24. (cancelled) A composite membrane as in Claim 23 wherein said organic sulfonic acid compound comprises methanesulfonic acid, trifluoromethanesulfonic acid or a mixture thereof.

25. (ON APPEAL; rejected) A composite membrane as in Claim 15 wherein said solution of an organic sulfonic acid compound comprises said organic sulfonic acid compound dispersed or dissolved in water, alcohol, glycol, alkoxy alcohol or a

carboxylic acid or a mixture thereof.

26. (cancelled) A composite membrane as in Claim 16 wherein said solution of an organic sulfonic acid compound comprises said organic sulfonic acid compound dispersed or dissolved in water, alcohol, glycol, alkoxy alcohol or a carboxylic acid or a mixture thereof.

27. (ON APPEAL; rejected) A composite membrane as in Claim 15 wherein said organic sulfonic acid compound comprises ethanesulfonic acid.

28. (ON APPEAL; objected to) A composite membrane as in Claim 15 wherein said organic sulfonic acid compound comprises trifluoromethanesulfonic acid.

29. (cancelled) A composite membrane useful for reverse osmosis or nanofiltration comprising:

a supportive porous under structure; and  
a top layer consisting of a crosslinked polyamide thin film which is adhered to the upper surface of the porous support structure, said top layer having been contacted with a solution of a C<sub>1</sub>-C<sub>6</sub> alkyl, alkenyl, haloalkyl, haloalkenyl, or hydroxy sulfonic or disulfonic acid compound,

whereby said membrane has a water flux of at least 15 gfd and a rejection of at least 20 percent when tested an a 0.05 percent aqueous sodium chloride at 75 psi and 25°C.

30. (cancelled) A composite membrane as in Claim 29 wherein said crosslinked polyamide comprises the reaction product of an aromatic diamine or triamine and an aromatic triacyl halide.

31. (cancelled) A composite membrane as in Claim 30 wherein said crosslinked polyamide comprises the reaction product of an aromatic diamine or triamine, an aromatic triacyl halide and an aromatic diacyl halide.

32. (cancelled) A composite membrane as in Claim 29 wherein the porous support is a polyarylethersulfone.

33. (cancelled) A composite membrane as in Claim 29 wherein said first membrane comprises a thin film, flat sheet, hollow fiber or tubular membrane.

34. (cancelled) A composite membrane as in Claim 29 wherein the membrane is a component of a spiral wound membrane filter or a plate and frame filter.

35. (cancelled) A composite membrane as in Claim 29 wherein said organic sulfonic or disulfonic acid compound comprises a sulfoacetic, sulfosuccinic, methanesulfonic, ethanesulfonic, or hydroxybutane sulfonic, compound or mixtures thereof.

36. (cancelled) A composite membrane as in Claim 29 wherein said organic sulfonic acid compound comprises methanesulfonic acid, trifluoromethanesulfonic acid or a mixture thereof.

37. (cancelled) A composite membrane as in Claim 29 wherein said solution of an organic sulfonic acid compound comprises said organic sulfonic acid compound dispersed or dissolved in water, alcohol, glycol, alkoxy alcohol or a carboxylic acid or a mixture thereof.

38. (cancelled) A composite membrane as in Claim 29 wherein said organic sulfonic acid compound comprises ethanesulfonic acid.

39. (cancelled) A composite membrane as in Claim 29 wherein said organic sulfonic acid compound comprises trifluoromethanesulfonic acid.

a. Identification of Claims on Appeal:

The claims on appeal are Claims 15-21, 23, 25 and 27-39, inclusive, prior to entry of the accompanying Amendment and Claims 15-21, 23, 25 and 27-28, if said Amendment is entered.

**b. Status of All Claims in the Proceeding:**

Prior to Amendment:

Claims 1-14:      Cancelled

Claims 15-21:      ON APPEAL; rejected

Claim 22:      Cancelled)

Claim 23:      ON APPEAL; rejected

Claim 24:      Cancelled

Claim 25:      ON APPEAL; rejected

Claim 26:      Cancelled

Claims 27-39:      ON APPEAL; rejected

Following entry of Amendment:

Claims 1-14:      Cancelled

Claims 15-21:      ON APPEAL; rejected

Claim 22:      Cancelled)

Claim 23:      ON APPEAL; rejected

Claim 24:      Cancelled

Claim 25:      ON APPEAL; rejected

Claim 26:      Cancelled

Claims 27-28:      ON APPEAL; rejected

Claims 29-39:      Cancelled

**IV. Status of Amendments**

Other than the amendment made herewith under 37 C.F.R. § 41.33 to cancel Claims 29-39, there There are no amendments which have been submitted since the final rejection and/or have not been entered.

**V. Summary of Claimed Subject Matter**

The subject matter of the invention is a composite membrane commonly referred to as a reverse osmosis ("RO") or nanofiltration ("NF") membrane for water purification. More particularly, the composite membrane is defined in Claim 15 as:

A composite membrane (¶ 0007, pg. 3) useful for reverse osmosis or nanofiltration (¶ 0003, pg. 1) comprising:

a supportive porous under-structure (¶ 0007, pg. 3); and

adhered thereto, a top layer consisting of a crosslinked polyamide thin film (¶ 0007, pg. 3; ¶ 0009, pg. 3) which has been contacted with a solution of a  $C_1$ - $C_6$  alkyl, alkenyl, haloalkyl, haloalkenyl, or hydroxy sulfonic or disulfonic acid compound (¶ 0010, pg. 3; ¶ 0011, pg. 4; original Claim 23),

whereby the resulting membrane has a water flux of at least about 15 gallons per square foot per day ("gfd") and a rejection of at least 20 percent when tested with 0.05% aqueous sodium chloride at 75 psi and 25°C (¶ 0003, pg. 2).

The most important sulfonic acid compounds from a commercial standpoint are methanesulfonic acid ("MSA"; ¶ 0011, pg. 4; ¶ 0017, pg. 6; ¶ 0022, pg. 7; original Claim 23) and trifluoromethanesulfonic acid ("TFMSA"; ¶ 0024, pg. 8; original Claim 23). Also of important is ethanesulfonic acid ("ESA"; amended Claim 27), the ~~close~~ analog of MSA.

The critical element in this invention which produces a superior membrane is that the top layer of the membrane has been *contacted with the low molecular weight ( $C_1$ - $C_6$ ) sulfonic or disulfonic acid* (¶ 0003, pp 1-2). A claimed membrane so treated requires *no other treatment* involving rejection enhancing agents to obtain the superior rejection and flux properties defined in the claims (¶ 0003, pg. 2).

As will be shown below, and as has been fully established in the record of the application by comparative and conclusive data, no other single treatment method can achieve this result. While the mechanism is not known with certainty, it is believed that these the application of these sulfonic acids alters the physical characteristics of the polyamide top layer of the membrane by swelling the crosslinked polyamide and solvating the uncrosslinked polyamide structures, so that subsequent rinsing removes the solvated fragments from the crosslinked film matrix leaving being a more permeable polymeric skin layer with the enhanced water permeability and salt rejection properties (¶ 0010, pp. 3-4).

The actual treatment procedure is described in ¶ 0015 (pg. 5) of the Specification, and involves application of about 1-15 gms of acid per m<sup>2</sup> of membrane surface, followed by drying (optionally with mild heating). Duration and temperature of acid application and drying will depend on the specific sulfonic acid being used and the desired degree of permeability to be obtained.<sup>2</sup>

## VI. Grounds of Rejection to be Reviewed on Appeal

The Final Rejection in the Office Action of August 11, 2004 (hereinafter referred to as "FR") states two grounds of rejection, both under 35 U.S.C. § 103(a). Both are on appeal and they are related.

- A. Claims 15-20 and 25 have been rejected under § 103(a) as obvious over:
  - a) Chau et al., U.S. Patent No. 4,983,291, in view of
  - b) 1) "applicant's Appellant's own admission by 131<sup>[3]</sup> affidavit" and
  - 2) Kiefer et al., "OPTIMIZING THE PERFORMANCE OF Low FOULING MEMBRANES FOR THE WORLD'S LARGEST NANOFILTRATION PLANT," a technical paper presented at the American Water Works Association meeting in Boca Raton, Florida, held March 2-5, 2003.

(FR, ¶ 1, pp. 2-3)

B. Claims 21, 23 and 27 have also been rejected under 35 U.S.C. § 103(a), and based on Chau et al. in view of "applicant's admission" and Keifer et al, and *further in view of* Koo et al., U.S. Patent No. 6,063,278 . (FR, § 2, pp.3-4)

Claim 28, which is limited to the specific use of TFMSA as the sulfonic acid, has been objected to but is deemed allowable if rewritten in independent form including all limitations of the preceding claims. (FR, "Allowable Subject Matter", pp. 4-5)

For both rejections, it is the Examiner's contention that Chau et al. discloses an equivalent membrane which has been contacted with a "sulfonic acid compound" and

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<sup>2</sup> As noted above, original Claims 1-14 related to the method of manufacture of the claimed membrane were subject to restriction and cancelled as non-elected, so the method of manufacture is described here only for information and is not subject to the present appeal.

<sup>3</sup> The Examiner in his final rejection refers to Appellant's so-called "admission" as being made in a "131 Affidavit." In fact Appellant has not filed any Affidavit under 37 C.F.R. ' 1.131. Rather Appellant's evidence statements to rebut prior art have been in the nature of affidavits filed under 37 C.F.R. ' 1.132. Appellant herein assumes that the Examiner's reference to a "131 Affidavit" is inadvertent, and the arguments herein are based on that assumption.

which has equivalent properties of salt rejection and flux (FR, ¶ 1, pg. 2). The Examiner contends that Chau et al discloses "sulfonic acid, toluene sulfonic acid, amine salt of sulfonic acid" as contacting agents (FR, ¶ 1, pg. 2). He acknowledges that Chau et al. does not teach whether other sulfonic acids would have the same effect, but he contends that "applicant's admission" and Keifer et al. provide such teaching (FR, ¶ 1, pg. 3).

For the second rejection, he contends that Koo et al. discloses MSA, ESA and benzene sulfonic acid for making RO membranes and that it would be obvious to one skilled in the art to use Koo et al's teaching in Chau et al's system (FR, ¶ 2, pg. 4).

The Examiner's reason for deeming two claims deemed allowable is that in his view TFMSA is not taught by either Chau et al. or Koo et al. and that Appellant's Applicant's data show superior results for TFMSA that is not shown for other sulfonic acids (FR, pg. 5).

## VII. Arguments

Appellant Applicant's submits that there are several reasons why the Examiner's rejections are not well founded and why Appellant's Applicant's invention would not be obvious to one skilled in the art under § 103(a).

1. From a chemistry standpoint, all of the following are applicable to some degree:
  - A. Chau et al. and Koo et al. do not teach membranes treated by sulfonic acids as claimed by Applicant Appellant;
  - B. The prior art disclosures of use of sulfonic acids by Chau et al. and Koo et al. in membrane production involve uses of sulfonic acids other than treating for property enhancement or the sulfonic compounds disclosed for treatment are not sulfonic acids or the equivalent thereof.
  - C. Neither Chau et al. nor Koo et al. teaches or suggests any enhancement of membrane properties of the type present in Appellant's Applicant's membranes.
2. From a procedural and legal standpoint,
  - A. Appellant's Applicant's statements submitted in the present application do not contain any adverse "admission" of facts as contended by the Examiner; rather Appellant's Applicant's statements all support a clear distinction between his invention

and those of Chau et al. and Koo et al.

B. The Keifer et al. article was not published or presented until 2003 and therefore also is not prior art under § 103(a) against Appellant's Applicant's application, which was filed in 2000.

Therefore, as Appellant Applicant will establish herein:

1. Both of the Examiner's combination rejections rely upon a) the Keifer et al. reference, which was not available prior to Appellant's Applicant's filing date, and b) an alleged "admission" which does not exist, such that neither is properly part of the final rejection. Since the Examiner has not made any other rejection, he has acknowledged that Appellant's Applicant's claims cannot be rejected without reliance on those two components. Therefore the two remaining components of the combinations (Chau et al. in the first rejection and Chau et al. plus Koo et al. in the second rejection) are by the Examiner's own action acknowledged to be insufficient to reject Appellant's Applicant's invention under the requirements of § 103(a); and
2. Since the Examiner's combination of the two referenced patents (Chau et al. and Koo et al.) does not teach Appellant's Applicant's claimed membranes or their chemistry or refute Appellant's Applicant's data showing the clear superiority of the claimed membranes in a manner which would be considered by one skilled in the art to be relevant, the rejections also do not meet the requirements of § 103(a).

a. ***Critical cited references are not prior art:***

There is no question but that patent or publication references which are cited to support a rejection under §§102 or 103(a) must have been publicly available prior to the filing date of an Appellant's Applicant's application; see *In re Koller et al.*, 613 F.2d 819, 204 U.S.P.Q. 702 (C.C.P.A.: 1980)<sup>4</sup>.

The present application was filed in November 2000. In his first rejection, two of the three references which the Examiner includes in his combination of alleged "prior art" -- Appellant's Applicant's so-called "admission" and the Keifer et al. paper -- did not

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<sup>4</sup> The only exceptions are where a patent reference meets the requirements of 35 U.S.C. ' 102(e), which applies to Koo et al., or where a post-filing reference is cited to show pre-filing facts, which is not applicable in the present case.

exist until at least 2003<sup>5</sup>. They therefore cannot be incorporated into a combination rejection of Appellant's Applicant's claims.

Similarly, In his second rejection, those two references make up two of the four references of the cited combination, notwithstanding that here they cannot be incorporated into a combination rejection of Appellant's Applicant's claims.

Thus, neither of the Examiner's grounds of rejection is proper under § 103(a), since both of the combinations of "prior art" relied upon include documents or alleged statements which did not exist prior to Appellant's Applicant's filing date. *Therefore on this ground alone both of the Examiner's rejections must be reversed.*

It must be accepted that if the Examiner had believed that a rejection was possible without reliance on the two post-2000 references, he would have made such a rejection. He has not done so. It is significant that these rejections came only after Appellant Applicant had submitted extensive comparative data refuting the Examiner's prior rejections and clearly establishing the major differences between the chemistry and properties of Appellant's Applicant's membranes and method as compared to those of the previously cited Chau et al and Koo et al. The fact that the Examiner then found himself forced to incorporate the two post-2000 references into his rejections in reply to those data necessarily means that he considers those two post-2000 references to be critical to his rejection of all of Appellant's Applicant's claims. Thus it is not now possible for either of his rejections to be upheld, since the presence of those post-2000 references expressly violates the requirements of § 103(a).

Removal of those two references leaves only Chau et al. as the basis for the Examiner's first rejection, and the Examiner makes no contention that Chau et al. is in any manner sufficient in and of itself. Indeed, it will be noted that the Examiner in the subject final rejection dropped prior rejections based on other references and thus acknowledged that only with the inclusion of the "admission" and Keifer et al. could basis for a rejection be found. Thus the rejection of Claims 15-20 and 25 over Chau et

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<sup>5</sup> Applicant has actually submitted two 132 Affidavits, one in 2003 and the other in 2004 (and an Informal Statement in the nature of a 132 Affidavit in 2004); see Part IX: Evidence Appendix below. The Examiner has not indicated specifically which document he is referring to. However, that is of no consequence in this case, since all have post-dated the filing of this application in 2000 and therefore none can be prior art.

al. in view of "applicant's admission" and Keifer et al. therefore must necessarily fall without the two secondary references.

The second rejection fares no better. With the "admission" and Keifer et al. gone, supplementation of Chau et al. with Koo et al. does not overcome the fatal deficiencies of the isolated Chau et al. reference. The Examiner's acknowledgement that Chau et al. alone is insufficient, coupled with his citation of Koo et al. as being of only limited relevance, makes it clear that the rejections of Claims 21, 23 and 27 under § 103(a) also cannot stand in the absence of the two post-2000 references.

Reversal of both of the Examiner's grounds of rejection is therefore respectfully requested.

b. *The Chau et al. and Koo et al. disclosures do not make Appellant's Applicant's invention obvious under § 103(a)*

In addition to the lack of a supportable combination of references as discussed above, it is clear that the disclosures of Chau et al. and Koo et al. do not describe membrane technology which would be considered by one skilled in the art to in any way teach or suggest Appellant's Applicant's claimed membranes within the requirements of § 103(a).

Considering first Chau, Chau is a broad but quite unspecific disclosure of acid treating of membranes. Chau has a long list encompassing numerous classes of acids and amines, including classes as large as the "inorganic acids" (col. 3, lines 45-48 and 62-65; col. 6, lines 60-65). Of these "sulfonic acids" is only one of the many classes. Only two specific sulfonic acids are identified (p-toluene sulfonic acid and m-toluene sulfonic acid; col. 7, lines 9-10)<sup>6</sup>, and neither of these is a C<sub>1</sub>-C<sub>6</sub> sulfonic acid. Further, it is clear that the sulfonic acid class is not favored by Chau. Only a single sulfonic acid (p-toluene sulfonic acid: "PTSA") appears in any of the Examples (Example 5, Table 4) and its properties are decidedly inferior to many other compounds tested, most notably the citric acids of Example 3, Table 2. It is clear, therefore, that no specific sulfonic acid

<sup>6</sup> The reference in that paragraph on line 8 to "sulfonic acid" is of no significance, since there is no recognized compound named "sulfonic acid." See, e.g., Grant, HACH's CHEMICAL DICTIONARY (4th ed.), p. 646 (McGraw-Hill Co., 1969) and Lewis, HAWLEY'S CONDENSED CHEMICAL DICTIONARY (13th ed.), p. 1060 (John Wiley & Sons, 1997). A rejection of a chemical invention cannot be based on a mention of a [non-existence] non-existent material.

meeting Appellant's claims is disclosed in the Chau patent.

It is well settled that a generic disclosure of a chemical class is not necessarily a disclosure of the individual members of the class. The disclosure must be assessed to determine whether one skilled in the art would be taught the particulars of the claimed invention, involving only a portion of that class, from the generic disclosure. In the present case, the teaching of Chau is away from such understanding by the person skilled in the art. Not only are the sulfonic acids as a class taught as inferior to other acids by Chau and the exemplification by Chau of individual sulfonic acids do not include any examples within the scope of Appellant's Applicant's claims, but in addition the only example of the sulfonic acid tested by Chau (PTSA) is shown to have properties outside the required properties of sulfonic acids for Appellant's Applicant's invention. Specifically, in Chau's Table 4, PTSA is shown to have a flux some 10% less than the minimum required in Appellant's Applicant's claims. This is evidenced in the current record by the calculations presented to the Examiner in Appendix B of the Amendment submitted on May 7, 2004. Further, both p- and m-toluene sulfonic acid are solids at the contacting temperatures of Appellant's Applicant's invention and therefore are inoperative for Appellant's Applicant's claimed invention, since they cannot effectively contact Appellant's Applicant's membranes to impart the claimed membrane properties.

Appellant Applicant has presented data in the Specification and in responses filed January 14, 2003 and May 7, 2004, which clearly establish the critical limitation that the C<sub>1</sub>-C<sub>6</sub> sulfonic acids are those operable in the claimed invention. Nothing in the Chau reference discloses any such criticality or even mentioned this subclass of sulfonic acids. Appellant Applicant has found nothing -- nor has the Examiner indicated anything -- in the Chau reference which would suggest to one skilled in the art that one must have these particular sulfonic acids to obtain the superior properties of Appellant's Applicant's membranes.

The Examiner acknowledges that Chau alone has insufficient disclosure to reject Claims 15-20 and 25 under § 103(a), since he has found it necessary to add the so-called "admission" and the Kiefer paper to obtain even minimal support for his rejection. Since as noted above the "admission" and the Kiefer paper are not prior art. Therefore,

in considering the rejection of those claims, only the Chau reference alone can be used to support the rejection, since the Examiner has not identified any other prior art document to supplement Chau. Chau, however, teaches nothing about Appellant's invention as claimed, and what Chau does teach about sulfonic acids at all is quite Applicant's limited, negative and directed entirely away from Appellant's Applicant's invention.

Therefore, since Chau cannot by itself support the rejection of Claims 15-20 and 25 under § 103(a) that rejection must be reversed, and such **reversal** is respectfully requested.

The Examiner has supplemented the rejection under § 103(a) of Claims 21, 23 and 27 over Chau with Koo as a tertiary reference, using the "admission" and Keifer as secondary references. Since the latter two are not prior art, the rejection must be considered to be one of "Chau in view of Koo." This rejection, also, cannot stand.

The Examiner's acknowledgement that Chau and Koo in combination are not sufficient to support the rejection has been discussed above, in connection with the impropriety of the "admission" and Keifer paper as prior art.

The rejection is also without merit even if one considers *arguendo* that the combination of Chau and Koo might stand even without the secondary references. The Examiner contends that these taken together teach Appellant's Applicant's invention. Chau, however, is fatally deficient in not teaching anything about sulfonic acids as claimed in Appellant's Applicant's claims, as discussed above. Koo not only does not overcome that deficiency, but in fact Koo does not even teach about sulfonic acids for treating membranes at all. Therefore not only does Koo not supplement Chau, in fact teaches even further away from Appellant's Applicant's invention.

Koo does disclose sulfonic acids, including two of the C<sub>1</sub>-C<sub>6</sub> sulfonic acids, methanesulfonic acid and ethanesulfonic acid (col. 6, lines 2-3), as well as many other "strong" acids such as nitric and hydrochloric acids. However, in Koo's process, none of the acids, including the sulfonic acids, are used for the production or treatment of membranes. Rather Koo uses amines or amine salts (col. 2, line 65-col. 3, line 5). The salts are the reaction products of strong acids and amines (col. 3, lines 6-7). Clearly a disclosure of production of a membrane from an amine or an amine salt does not teach

one skilled in the art anything about treatment of a membrane with a specific subgroup of sulfonic acids to enhance the membrane properties.

Since Koo does include low molecular weight sulfonic acids as among his "strong acids," Koo does disclose that those sulfonic acids can be reacted with amines to produce some of his amine salts. However, those skilled in the art would be aware from basic chemistry that a salt made from an acid is an entirely different compound with entirely different properties. The person skilled in the art would also be aware that such a salt reacts with other materials in ways that cannot be reliably predicted from the knowledge of the acid from which the salt was formed. Thus Koo's teaching of using amine salts made from sulfonic acids in the production of membranes can teach nothing to the person skilled in the art about how membranes as claimed in Appellant's Applicant's claims would react to contact with the sulfonic acids. Indeed the teaching of Koo is further deficient in this area, since according to his process by the time the membrane is formed all acids are gone from his system, having been fully reacted into amine salts. Thus while sulfonic acids may be present at the beginning of Koo's membrane production method, they are quickly all reacted into the amine salts and do not further participate in any aspect of Koo's invention.

This disclosure makes Chau and Koo mutually incompatible and mutually contradictory. Chau seeks to treat membranes at the end of production with acids, including some high molecular weight sulfonic acids. Koo seeks to destroy all acids at the beginning of his process to produce amine salts. No one skilled in the art would consider combination of two disclosures, one of which teaches to destroy the very compounds that the other process requires for its operation.

Appellant Applicant respectfully directs the attention of the Board to his Amendment filed on June 18, 2003, and particularly to Appellant's Applicant's Declaration appended thereto. In that Declaration Appellant Applicant's presents direct comparisons of his system to those of Chau and Koo. Those data clearly establish that Appellant's Applicant's invention is substantially superior to either of Chau or Koo. It will be evident that since the combination of Chau and Koo proposed by the Examiner represents the forced overlay of two mutually incompatible systems, one of which essentially acting to destroy the acids that the other requires, the data also establish

that Appellant's Applicant's invention must be even further differentiated from the Examiner's Chau/Koo combination.

Since Chau and Koo A) would be recognized by those skilled in the art as not being able to be combined as the Examiner proposes, B) even if so combined would be recognized by those skilled in the art as inoperable, and C) individually or in combination seen by those skilled in the art to result in a system far inferior to Appellant's Applicant's claimed invention, it follows that the rejection of Claims 21, 23 and 27 under § 103(a) is not supported by Chau in view of Koo and therefore the rejection must fall. **Reversal** of the Examiner's rejection of those claims is therefore respectfully requested.

Since the so-called "admission" and the Keifer paper are not prior art, it is believed by Appellant Applicant that they do not require analysis in this brief. Therefore Appellant Applicant will here note only the following as to those items:

1. The Examiner contends that Appellant Applicant "admits" that an membrane denoted the "Koch" membrane in the Keifer paper is equivalent to Chau's membrane. Appellant Applicant presented evidence about the Chau reference by name in the June 18, 2003 response, and showed why his invention was far superior. Why the Examiner now thinks that merely mentioning the same membrane by another name is some sort of "admission" is not understood by Appellant Applicant since the more recent submission by Appellant Applicant of the Keifer paper is merely a continuation of the arguments Appellant Applicant has been making in this case all along. Clearly neither the mention of the Koch membrane nor Appellant's Applicant's data on the Chau membrane can in any way help the Examiner to overcome the fatal deficiencies in the Chau reference.

2. The Examiner also contends that Appellant Applicant "inadvertently" "admitted" that Chau's membranes' properties are superior. Appellant Applicant has countered that by providing calculations in Appendix B of the May 7, 2004 response to support his determination that the Chau membrane is inferior in its properties, contrary to the Examiner's contentions. The Examiner has not rebutted those calculations nor provided calculations of his own, such as by an Examiner's Affidavit under 37 C.F.R. § 1.104(d)(c), to support his contention.

3. In any event, Appellant notes Applicant points out that the Examiner's reliance on Appellant's Applicant's Affidavit or on the Keifer mention of a Koch membrane is of no consequence, since the Affidavit was submitted during prosecution of this application and thus was not even in existence prior to the filing date of the application, and the Keifer paper was not published until 2002, so by definition neither one can be relied upon or cited as "prior art".

**VIII. Oral Hearing:**

An oral hearing is not being requested.

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{conclusion on next page}

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**IX. Conclusion And Request**

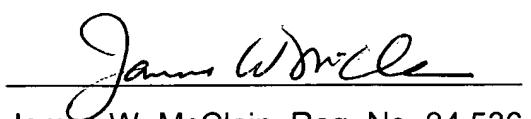
In view of the facts and arguments set forth above, Appellant Applicant submits that it has been shown conclusively that the Examiner's rejections are supported neither by fact nor by law, and that the rejections therefore are without merit and cannot stand. Appellant Applicant therefore respectfully requests that this Honorable Board of Appeal **REVERSE** the Examiner's ruling in total, rule that the rejections do not meet the requirements of 35 U.S.C. § 103(a) as to any of the rejected claims, and remand the

application to the Examiner for allowance of all Claims 15-21, 23, 25 and 27-28, all claims currently in the application and on appeal herein.

Date Filed: March 8, 2005

Respectfully submitted,

Date Substituted: April 27, 2005

  
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**VIII: Appendix A: Claims on Appeal:**

(Prior to entry of concurrently submitted Amendment; effect of such entry will be to reduce claims on appeal to Claims 15-21, 23, 25, and 27-28 inclusive)

15. A composite membrane useful for reverse osmosis or nanofiltration comprising:  
a supportive porous under-structure; and  
a top layer consisting of a crosslinked polyamide thin film which is adhered to the upper surface of the porous support structure, said top layer having been contacted with a solution of a C<sub>1</sub>-C<sub>6</sub> alkyl, alkenyl, haloalkyl, haloalkenyl, or hydroxy sulfonic or disulfonic acid compound,  
whereby said membrane has a water flux of at least about 15 gfd and a rejection of at least 20 percent when tested an a 0.05 percent aqueous sodium chloride at 75 psi and 25°C.
16. A composite membrane as in Claim 15 wherein said crosslinked polyamide comprises the reaction product of an aromatic diamine or triamine and an aromatic triacyl halide.
17. A composite membrane as in Claim 16 wherein said crosslinked polyamide comprises the reaction product of an aromatic diamine or triamine, an aromatic triacyl halide and an aromatic diacyl halide.
18. A composite membrane as in Claim 15 wherein the porous support is a polyarylethersulfone.
19. A composite membrane as in Claim 15 wherein said first membrane comprises a thin film, flat sheet, hollow fiber or tubular membrane.
20. A composite membrane as in Claim 15 wherein the membrane is a component of

a spiral-wound membrane filter or a plate and frame filter.

21. A composite membrane as in Claim 15 wherein said organic sulfonic or disulfonic acid compound comprises a sulfoacetic, sulfosuccinic, methanesulfonic, ethanesulfonic, or hydroxybutane sulfonic compound or mixtures thereof.

23. A composite membrane as in Claim 15 wherein said organic sulfonic acid compound comprises methanesulfonic acid, trifluoromethanesulfonic acid or a mixture thereof.

25. A composite membrane as in Claim 15 wherein said solution of an organic sulfonic acid compound comprises said organic sulfonic acid compound dispersed or dissolved in water, alcohol, glycol, alkoxy alcohol or a carboxylic acid or a mixture thereof.

27. A composite membrane as in Claim 15 wherein said organic sulfonic acid compound comprises ethanesulfonic acid.

28. A composite membrane as in Claim 15 wherein said organic sulfonic acid compound comprises trifluoromethanesulfonic acid.

29. A composite membrane useful for reverse osmosis or nanofiltration comprising: a supportive porous under-structure; and a top layer consisting of a crosslinked polyamide thin film which is adhered to the upper surface of the porous support structure, said top layer having been contacted with a solution of a C<sub>1</sub>-C<sub>6</sub> alkyl, alkenyl, haloalkyl, haloalkenyl, or hydroxy sulfonic or disulfonic acid compound,

whereby said membrane has a water flux of at least about 15 gfd and a rejection of at least 20 percent when tested an a 0.05 percent aqueous sodium chloride at 75 psi and 25°C.

30. A composite membrane as in Claim 29 wherein said crosslinked polyamide comprises the reaction product of an aromatic diamine or triamine and an aromatic triacyl halide.

31. A composite membrane as in Claim 30 wherein said crosslinked polyamide comprises the reaction product of an aromatic diamine or triamine, an aromatic triacyl halide and an aromatic diacyl halide.

32. A composite membrane as in Claim 29 wherein the porous support is a polyarylethersulfone.

33. A composite membrane as in Claim 29 wherein said first membrane comprises a thin film, flat sheet, hollow fiber or tubular membrane.

34. A composite membrane as in Claim 29 wherein the membrane is a component of a spiral-wound membrane filter or a plate and frame filter.

35. A composite membrane as in Claim 29 wherein said organic sulfonic or disulfonic acid compound comprises a sulfoacetic, sulfosuccinic, methanesulfonic, ethanesulfonic, or hydroxybutane sulfonic compound or mixtures thereof.

36. A composite membrane as in Claim 29 wherein said organic sulfonic acid compound comprises methanesulfonic acid, trifluoromethanesulfonic acid or a mixture thereof.

37. A composite membrane as in Claim 29 wherein said solution of an organic sulfonic acid compound comprises said organic sulfonic acid compound dispersed or dissolved in water, alcohol, glycol, alkoxy alcohol or a carboxylic acid or a mixture thereof.

38. A composite membrane as in Claim 29 wherein said organic sulfonic acid

compound comprises ethanesulfonic acid.

39. A composite membrane as in Claim 29 wherein said organic sulfonic acid compound comprises trifluoromethanesulfonic acid.

**IX: Appendix B: Evidence:**

Attached hereto are copies of the following evidence documents which have been entered into the file of this application during the prosecution thereof by Appellant or the Examiner and which are mentioned in Appellant's arguments above:

**A. Evidence submitted by Appellant:**

Exhibit 1: Kiefer et al., "OPTIMIZING THE PERFORMANCE OF Low FOULING MEMBRANES FOR THE WORLD'S LARGEST NANOFILTRATION PLANT," a technical paper presented at the American Water Works Association meeting in Boca Raton, Florida, held March 2-5, 2003; entered into record by Appellant as Appendix D to Appellant's Amendment filed May 7, 2004.

Exhibit 2: Declaration of John. Tomaschke Under 37 C.F.R. § 1.132 dated June 18, 2003 and submitted by Appellant as part of his Response to a final rejection filed on June 18, 2003.

Exhibit 3: "Information Communication" of Appellant entered into record by Appellant as Appendix B to Appellant's Amendment filed May 7, 2004.

Exhibit 4: Declaration/Affidavit of John E. Tomaschke Under 37 C.F.R. § 1.132 dated May 6, 2004 and submitted by Appellant as part of his Response to a final rejection filed on May 7, 2004.

**B. Prior Art cited by the Examiner:**

Exhibit 5: U.S. Patent No. 6,063,278 to Koo et al.; issued May 16, 2000; cited by the Examiner in the Office Action of June 19, 2002.

Exhibit 6: U.S. Patent No. 4,983,291 to Chau et al.; issued Jan. 8, 1991; cited by the Examiner in the Office Action of October 23, 2002.

**C. Authorities cited in Appellant's legal analysis:**

Exhibit 7: Decision in *In re Koller et al.*, 613 F.2d 819, 204 U.S.P.Q. 702 (C.C.P.A.: 1980).

Exhibit 8: Grant, HACHK's CHEMICAL DICTIONARY (4th ed.), p. 646 (McGraw-Hill Co., 1969)

Exhibit 9: Lewis, HAWLEY'S CONDENSED CHEMICAL DICTIONARY (13th ed.), p. 1060 (John Wiley & Sons, 1997)

**X: Appendix C: Related Proceedings:**

There are no other proceedings related to this application or appeal.